



QS18CV20 Mechanically Adjustable Convergent Diffuse Sensors

Original Instructions

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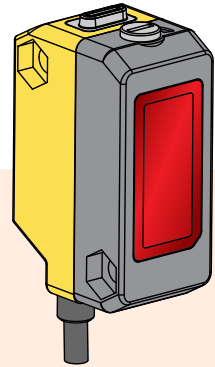
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Chapter 1 Features

Miniature sensors with visible red LED

- Economical adjustable convergent diffuse sensor for part presence detection
- Simple multi-turn screw adjustment of the receiver lens changes the location of peak excess gain and maximum sensing distance
- 10 V DC to 30 V DC operation, with complementary NPN or PNP outputs, depending on model
- Robust immunity to energy-efficient lights in the environment



WARNING:



- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

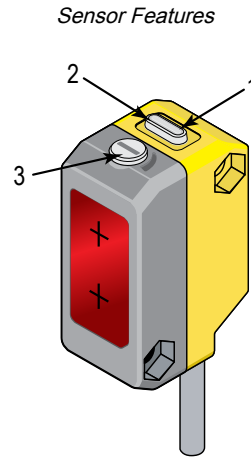
Models

Models	Sensing Beam	Range	Cordset	Supply Voltage	Output Type
QS18VN6CV20	Visible red LED, 633 nm	Lens Adjuster fully clockwise: 1 mm to 150 mm on 90% white card	2 m (6.5 ft) 4-wire	10 to 30 V DC	NPN
QS18VP6CV20		Lens Adjuster fully counter-clockwise: 1 mm to 30 mm on 90% white card			PNP

Integral 2 m (6.5 ft) unterminated cable models are listed.

- To order the 9 m (30 ft) PVC cable model, add the suffix "W/30" to the cabled model number. For example, QS18VN6CV20 W/30
- To order the 150 mm (6 in) PVC cable model with a 4-pin M8 quick disconnect, add the suffix "Q" to the model number. For example, QS18VN6CV20Q. Models with a quick disconnect require a mating cordset.
- To order the 150 mm (6 in) PVC cable model with a 4-pin M12 quick disconnect, add the suffix "Q5" to the model number. For example, QS18VN6CV20Q5. Models with a quick disconnect require a mating cordset.

Overview

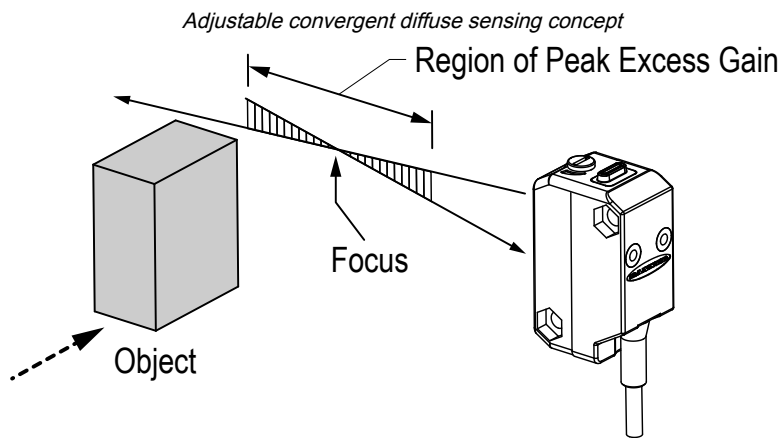


The QS18 Adjustable Convergent Diffuse Sensor is a full-featured sensor in a miniature package. It provides control of the location of the peak excess gain, enabling economical detection of targets and stable rejection of background objects. Models are available with a visible red LED sensing beam.

This adjustable convergent diffuse sensor is able to detect objects of relatively low reflectivity, while ignoring other objects in the background (beyond the cutoff point). The convergent point and peak excess gain location distance is mechanically adjustable, using the 5-turn adjustment screw on the sensor top. Backgrounds and background objects must *always* be placed beyond the maximum detection distance.

- 1. Green: Power Indicator
- 2. Amber: Light Sensed Indicator (Flashes for Low Gain Conditions)
- 3. Lens Adjuster

Adjustable Convergent Diffuse Sensing—Theory of Operation



The adjustable convergent diffuse sensing mode is a hybrid concept that combines:

- Intensity-based diffuse sensing
- Convergent optics, which provide a concentrated light intensity signal at a user-set distance
- Mechanically adjustable receiver lens, which allows the user to set up a reliable detection in many cost-sensitive applications

This sensing mode provides a cost-effective sensor solution in some applications where a full background suppression sensor is too costly. The sensor uses a single photo detector, which receives light when the combination of lens position and target distance fall within the sensing range of the sensor. If the amplitude of the received light exceeds the detection

threshold, the output turns ON. Targets beyond the maximum sensing distance, or targets with extremely low reflectivity result in the output remaining OFF.

At the convergent optical distance of 20 mm nominally, the peak excess gain exceeds 100 times the detection threshold, so very dark targets can be reliably detected. The peak excess gain location can be moved between approximately 10 mm to 30 mm by adjusting the lens position with the Lens Adjuster.

Due to the finite size of the photodetector, and the ability to move the receiver lens, the excess gain off a 90% white card target can be reduced to < 1 at convenient distances of 50 mm to 150 mm allowing the sensor to ignore background objects.

Specifications

Supply Voltage

10 V DC to 30 V DC (10% maximum ripple) at less than 25 mA, exclusive of load

Sensing Beam

Visible red LED, 633 nm

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configuration

Current sourcing (PNP) or current sinking (NPN), depending on model.

Rating: 100 mA maximum

OFF-State leakage current: < 50 μ A at 30 V dc

ON-State saturation voltage: < 1.5 V dc at 10 mA; < 3 V dc at 100 mA

Output Response

850 microseconds ON/OFF; 100 ms delay on power-up; outputs do not conduct during this time

Repeatability

89 microseconds

Spot Size (horizontal x vertical mm)

10 mm distance: 5 x 5 mm

100 mm distance: 4 x 4 mm

200 mm distance: 9 x 9 mm

Adjustments

Five-turn adjustment screw sets cutoff distance between minimum and maximum positions, clutched at both ends of travel

Construction

ABS housing, acrylic lens cover, 2.5 mm and 3 mm mounting hardware included

Connections

2 m (6.5 ft) unterminated 4-wire PVC-jacketed cable, 9 m (30 ft) unterminated 4-wire PVC-jacketed cable, 150 mm (6 in) PVC-jacketed cable with a 4-pin M8 male quick-disconnect connector, or 150 mm (6 in) PVC-jacketed cable with a 4-pin M12 male quick-disconnect connector, depending on model

Environmental Rating

IP67, NEMA 6, UL Type 1

Operating Conditions

-20 °C to +70 °C (-4 °F to +158 °F)

95% at +50 °C maximum relative humidity (non-condensing)

Certifications



Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM



Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN



Required Overcurrent Protection



WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.

Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (A)	Supply Wiring (AWG)	Required Overcurrent Protection (A)
20	5.0	26	1.0
22	3.0	28	0.8
24	2.0	30	0.5

FCC Part 15 Class A for Unintentional Radiators

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Industry Canada ICES-003(A)

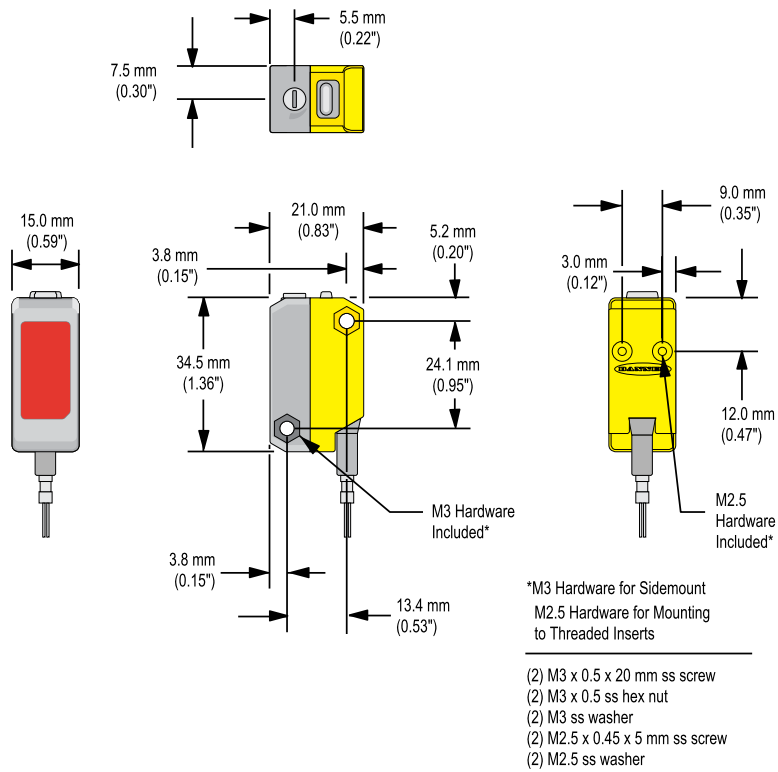
This device complies with CAN ICES-3 (A)/NMB-3(A). Operation is subject to the following two conditions: 1) This device may not cause harmful interference; and 2) This device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme à la norme NMB-3(A). Le fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne peut pas occasionner d'interférences, et (2) il doit tolérer toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité du dispositif.

Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise. The measurements provided are subject to change.

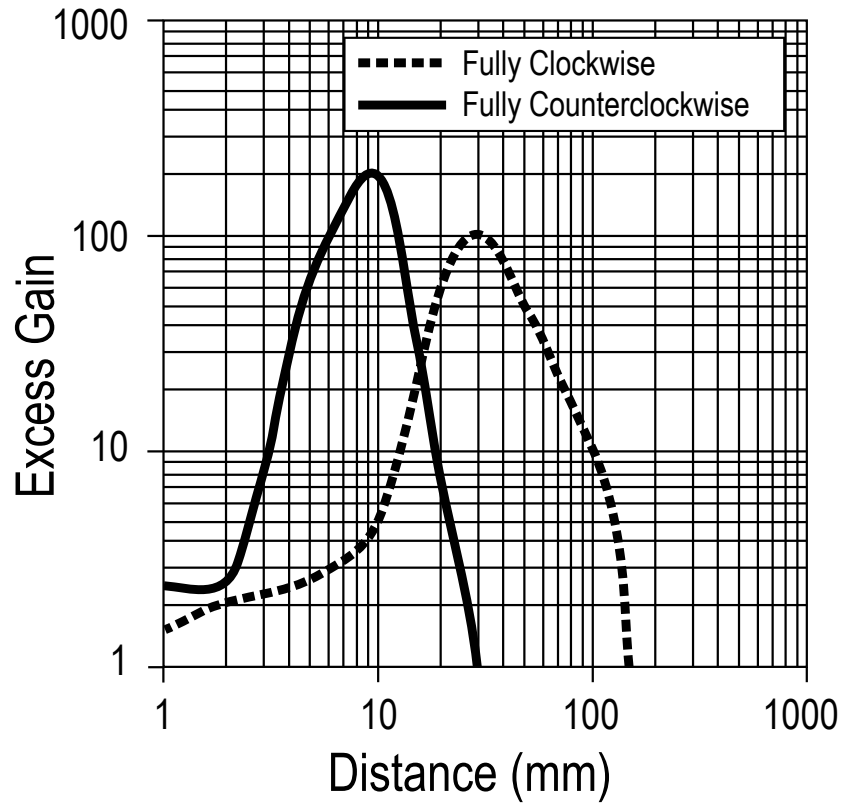
QS18CV20 Dimensions



Performance Curves—Excess Gain

The performance is based on 90% reflectance white test card

Excess Gain at Limits of Lens Adjuster Positions



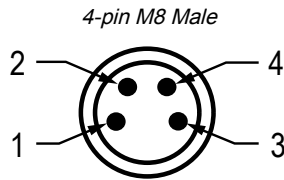
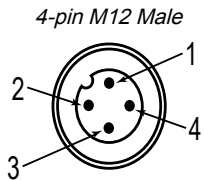
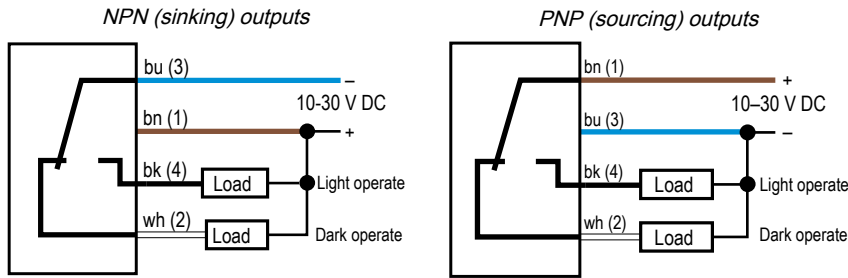
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Chapter 2 Installation

Wiring Diagrams

Cabled wiring diagrams are shown. Quick disconnect wiring diagrams are functionally identical.



- 1. Brown
- 2. White
- 3. Blue
- 4. Black

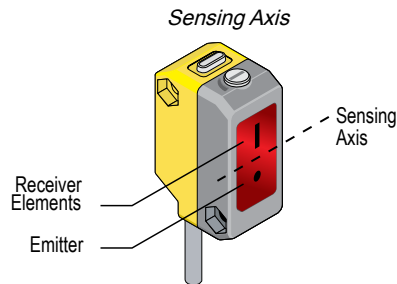
In dark operate (DO) mode, the output is ON when the target returns less light to the sensor than the configured target and OFF when the sensor detects more light than the configured/taught target.

In light operate (LO) mode, the output is ON when the target returns the same or more light to the sensor and OFF when the sensor detects less light than the configured/taught target.

In **diffuse** sensing modes, light operate is active when the target is present and dark operate is active when the target is absent.

Set the Location of Peak Excess Gain

Use the following procedure to set the sensor for reliable detection of the target and non-detection of the background.



When an object approaches from the side, the most reliable sensing usually occurs when the line of approach is parallel to the sensing axis.

1. Check the application parameters, such as target reflectivity and sensor-to-target distance, evaluate the background conditions, and compare them with the excess gain graph in "[Figure: Excess Gain at Limits of Lens Adjuster Positions](#)" on page 7.
2. Turn the lens adjuster fully counterclockwise.
This maximizes peak excess gain, minimizes hysteresis, and minimizes the influence of the background beyond 30 mm.
3. Present the target at the desired sensing range, and verify stable detection of the target (amber LED is on).
4. If the amber LED is off, turn the lens adjuster clockwise to increase the detection range until the target is detected (amber LED is on).
5. Remove the target, and verify that the background is not detected (amber LED is off).
6. If the background is detected (the amber LED is on or flashes), turn the lens adjuster counter-clockwise until the amber LED is off when no target is present.
7. Present the target at the desired sensing range, and verify that the amber LED turns on.
8. If the amber LED remains off, turn the lens adjuster clockwise to increase the detection range.
9. Remove the target.
 - If the amber LED turns off, the sensor is ready for use in the application.
 - If the amber LED remains on or flashes, the influence from the background is too strong. Evaluate the use of an adjustable field background suppression sensor instead of an adjustable diffuse convergent sensor.

Sensing Reliability

For the highest sensitivity, position the target at or near the distance of maximum excess gain. See "[Figure: Excess Gain at Limits of Lens Adjuster Positions](#)" on page 7. The maximum excess gain for the sensor is between 10 mm and 30 mm, depending on the lens adjuster setting. Sensing at or near this distance makes the maximum use of the sensor's available sensing power. The background must be placed beyond the maximum sensing distance. Note that the reflectivity of the background surface also may affect the maximum sensing distance.

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Quick-Disconnect (QD) Cordsets

Use the M8 cordsets with QS18 with Q suffix; use the M12 cordsets with QS18 with Q5 suffix.

4-Pin Single-Ended Snap-on M8 Female Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
PKG4-2	2.03 m (6.66 ft)	Straight		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>

4-pin Single-Ended M12 Female Cordsets				
Model	Length	Dimensions (mm)	Pinout (Female)	
BC-M12F4-22-1	1 m (3.28 ft)		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused</p>	
BC-M12F4-22-2	2 m (6.56 ft)			
BC-M12F4-22-5	5 m (16.4 ft)			
BC-M12F4-22-8	8 m (26.25 ft)			
BC-M12F4-22-10	10 m (30.81 ft)			
BC-M12F4-22-15	15 m (49.2 ft)			
BC-M12F4-22-20	20 m (65.61 ft)			
BC-M12F4-22-25	25 m (82.02 ft)			
BC-M12F4-22-30	30 m (98.42 ft)			

4-pin Single-Ended M12 Female Right-Angle Cordsets				
Model	Length	Dimensions (mm)	Pinout (Female)	
BC-M12F4A-22-1	1 m (3.28 ft)		<p>1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused</p>	
BC-M12F4A-22-2	2 m (6.56 ft)			
BC-M12F4A-22-5	5 m (16.4 ft)			
BC-M12F4A-22-8	8 m (26.25 ft)			
BC-M12F4A-22-10	10 m (30.81 ft)			
BC-M12F4A-22-15	15 m (49.2 ft)			

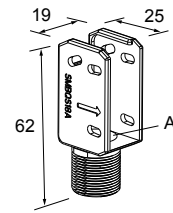
Mounting Brackets

All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.

SMBQS18A

- Wrap-around protection bracket
- Die-cast bracket
- Base fits 18 mm threaded hole
- Metal hex nut, lock washer and grommet included
- Mounting holes specially designed for QS18AF sensors

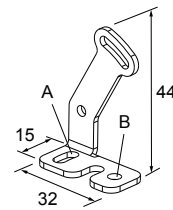
Hole size: A = \varnothing 15.3



SMBQS18AF

- Right-angle mounting bracket
- 14-ga. 304 stainless steel

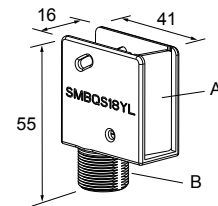
Hole center spacing: A to B = 20.3
Hole size: A = 4.3 × 9.4, B = \varnothing 4.3



SMBQS18YL

- Heavy-duty die-cast bracket for industrial protection
- Replaceable window (A)
- M18 vertical mount-option
- Nut and lock washer included
- Only for use with Class 2 laser models

Hole size: B = \varnothing 15.3



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Chapter 4 Product Support and Maintenance

Clean Sensor with Compressed Air Then Isopropyl Alcohol

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. create stray light that may degrade the peak performance of the sensor.

Blow dust from the sensor using filtered, compressed air. If the sensor is still dirty, gently wipe the sensor with a dry optical cloth. If the dry optical cloth does not remove all residue, use 70% isopropyl alcohol on a clean optical cloth, then dry with a clean dry optical cloth and blow with filtered, compressed air. Do not use any other chemicals for cleaning.

Contact Us

Banner Engineering Corp. | 9714 Tenth Avenue North | Plymouth, MN 55441, USA | Phone: + 1 888 373 6767

For worldwide locations and local representatives, visit www.bannerengineering.com.

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